

Claims

[1] A process for preparing a cathode active material for a lithium secondary battery, having a formula $\text{Li}_{1+\delta} [\text{Ni}_{x} \text{Mn}_{x-y/2} \text{Co}_{1-2x-z} \text{M}_{y} \text{N}_{z}] \text{O}_{2-a} \text{P}$ or $\text{Li}_{1+\delta} [\text{Ni}_{x} \text{Mn}_{x+y} \text{Co}_{1-2(x+y)} \text{M}_{y}] \text{O}_{2-a} \text{P}$ ($\text{M} = \text{Mg, Zn, Ca, Sr, Cu, Zr, N} = \text{Fe, Al, Ga, In, Cr, Ge, Sn, P} = \text{F, S, -1/10} \leq \delta \leq 1/10, 0 \leq x \leq 1, 0 \leq y \leq 1/10, 0 \leq z \leq 1/10, 0 \leq a \leq 0.3$), comprising the steps of: simultaneously, adding a metal precursor, an aqueous ammonia solution and a basic solution to a reactor and mixing and precipitating them to obtain a metal composite hydroxide; and mixing and reacting the metal composite hydroxide with a lithium precursor to obtain a lithium metal composite oxide.

[2] The process as set forth in claim 1, wherein an aqueous solution containing more than two metal salts is used as the metal precursor.

[3] The process as set forth in claim 2, wherein the concentration of the aqueous ammonia solution is between 0.2 and 0.3 of the aqueous metal solution.

[4] The process as set forth in claim 1, wherein a retention time of the metal precursor in the reactor is between 5 and 10 hours.

[5] The process as set forth in claim 1, wherein the basic solution is added to make a pH of 11.0 to 11.5.

[6] The process as set forth in claim 1, wherein in the step of obtaining the lithium metal composite oxide, citric acid, stannic acid, glycolic acid or maleic acid is used as a chelating agent.

[7] A reactor for preparing a cathode active material for a lithium secondary battery, having a structure in which rotary vanes are designed in a reverse vane type, and baffles are spaced apart from the inner wall of the reactor.

[8] The reactor as set forth in claim 7, wherein the number of baffles is 3.

[9] A cathode active material for a lithium secondary battery prepared by a process as set forth in any one of claims 1 to 6.

[10] The cathode active material as set forth in claim 9, wherein a particle diameter of primary particles is between 0.1 and 2 μm , a mean particle diameter of secondary particles is 10 μm , and the active material has a layered rock salt structure.

[11] The cathode active material as set forth in claim 9, wherein an oxidation value of nickel is 2.0, an oxidation value of manganese is 4.0 and an oxidation value of cobalt is 3.0.

[12] The cathode active material as set forth in claim 9, further comprising:

a lithium composite oxide B having a mean particle diameter smaller than that of the cathode active material.

- [13] The cathode active material as set forth in claim 12, wherein a mean particle diameter of the lithium composite oxide B is less than 90% of that of the cathode active material of claim 9.
- [14] The cathode active material as set forth in claim 12, wherein the amount of the lithium composite oxide B is between 5 and 40 wt%.
- [15] The cathode active material as set forth in claim 12, wherein the lithium composite oxide B has the same composition as the cathode active material of claim 8, or is represented by a general formula of $\text{LiNi}_{1-x-y} \text{Co}_x \text{M}_y \text{O}_{2-z} \text{P}_z$ ($\text{M} = \text{Al, Mg, Zr, Ti, P} = \text{F, S}$, $0 \leq x \leq 0.1$, $0 \leq y \leq 0.1$, $0 \leq z \leq 0.1$)